REMARKS

Claims 1 and 4-6 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Manabe (JP 10-278501) in view of Vaxelaire et al. (USPN 6,726,291). Applicant traverses the rejection because Manabe and Vaxelaire, taken alone or in combination, fail to disclose or suggest that a spring constant of a rim body portion of a wheel is maintained so that the natural frequency of the wheel is greater than the natural frequency of a pneumatic tire.

Manabe discloses a wheel that includes multiple sections 26-38. As shown in Fig. 2 of Manabe, the wheel has different rim thicknesses at different sections of the wheel, with a thickness T(A) at a shrunk diameter section 32, a thickness T(B) at a tapered section 34, and a thickness T(C) at an inside cylindrical section 36. However, as acknowledged by the examiner, Manabe fails to disclose or suggest that a natural frequency of the wheel is greater than a natural frequency of the pneumatic tire, as recited in claim 1 of the present application.

Vaxelaire teaches that a wheel has three natural modes of vibration: a tilting mode D_1 where a disk portion of the wheel vibrates at approximately 270 Hz, a pumping mode D_2 where the disk portion of the wheel vibrates at approximately 670 Hz, and a rim mode J_1 where a rim portion of the wheel vibrates at about 240 Hz. Vaxelaire describes techniques that alter the frequency of the tilting mode of vibration. For example, the reference discloses changing the frequency by adjusting radial distance of a curved protuberance relative to the axis of a wheel alters the stiffness of the disk (Vaxelaire, col. 5,

lns. 22-24). Vaxelaire also teaches that circumferentially localized lumps, as shown in Figs. 9(a) and 9(b) improve tilting rigidity (col. 6, lns. 16-18, 41-55).

Fig. 3(a) of Vaxelaire shows the vibration response of a conventional wheel, while Fig. 3(b) shows the vibration response of a wheel having an altered shape. As shown in the graphs, the changes to the wheel shape affect the vibration response of the wheel by splitting the peak D_1 into two separate peaks. The examiner asserts that Vaxelaire is cited as disclosing that altering the structure of a wheel affects the natural frequency of a wheel. Vaxelaire discloses that the vibration response of a wheel can be altered by increasing the thickness of the wheel. However, the reference does not disclose or suggest any techniques for maintaining a spring constant of a wheel while reducing the wheel's thickness and weight, as recited in claim 1 of the present application.

Further, while Vaxelaire discloses altering the vibration response of a wheel, the reference is silent regarding the natural frequency of a tire associated with the wheel. Accordingly, it follows that Vaxelaire also fails to disclose that the natural frequency of the wheel is greater than the natural frequency of a tire.

In contrast, independent claim 1 of the present application recites that a spring constant of a rim body portion of a wheel is maintained so that a natural frequency of the wheel is greater than that of a pneumatic tire. The present specification teaches that a rim body portion is not uniform in thickness. Instead, as shown in Fig. 1 of the present application, a tire rim 21X is divided into three equal sections X1, X2, and X3, each of the equal sections having a different average thickness. Rim thicknesses are selected such that

the average rim thickness in a disk side section is thickest, the average rim thickness of the flange side section is thinnest, and the average thickness of the middle section is between that of the disk side section and that of the flange side section. Setting rim thicknesses for the wheel sections in this way advantageously maintains a spring constant at the same level as before the wheel rim thickness was reduced (see applicant's specification p. 5, lns. 4-6). That is, while the thickness of a rim according to an embodiment of the present application is reduced, the spring constant (and thus the natural frequency) of the wheel is not changed. Maintaining the spring constant in this way helps to ensure that the natural frequency of the wheel is distinct from the natural frequency of the tire. Since Manabe and Vaxelaire, taken alone or in combination, fail to disclose reducing rim thickness while maintaining a spring constant of the rim, or that the natural frequency of the wheel is greater than the natural frequency of the pneumatic tire, withdrawal of the rejection of independent claim 1 and its dependent claims is respectfully requested.

Applicant further traverses the rejection of claims 1 and 4-6 because Manabe and Vaxelaire, whether taken alone or in combination, fail to disclose or suggest that a rim body portion of a wheel is divided into three equal sections.

Manabe teaches that a rim-like section 40 forms a flange section 26, an outside cylindrical section 28, a stepped section 30, a shrunk diameter section 32, a tapered section 34, an inside cylindrical section 36 and a flange 38. Thus, Manabe describes a rim section divided into 7 sections, rather than three, as recited in claim 1 of the present application.

Further, Manabe is silent regarding the relative widths of the sections. Accordingly, Manabe fails to disclose dividing the rim body portion axially into three equal portions.

Vaxelaire describes a wheel that includes a rim and a disk. However, Vaxelaire is silent regarding dividing the rim into sections. Accordingly, it follows that the reference also fails to disclose a rim including three equal sections, as recited in claim 1. Accordingly, since Manabe and Vaxelaire, alone or in combination, fail to disclose or suggest that a rim body is divided into three equal sections, as recited in claim 1 of the present application, applicant again requests withdrawal of the rejection of claims 1 and 4-6.

For the foregoing reasons, applicant believes that this case is in condition for allowance, which is respectfully requested. The examiner should call applicant's attorney if an interview would expedite prosecution.

The Commissioner is hereby authorized to charge fees which may be required to this application under 37 C.F.R. §§1.16-1.17, or credit any overpayment, to Deposit Account No. 07-2069.

Respectfully submitted,

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